

**RHODE ISLAND DEPARTMENT OF HEALTH
DIVISION OF DISEASE PREVENTION AND CONTROL
OFFICE OF COMMUNICABLE DISEASES**



**ARBOVIRUS SURVEILLANCE
FINAL REPORT
2003 SEASON**

FEBRUARY 2004

ARBOVIRUS SURVEILLANCE, 2003

BACKGROUND

Since 2000, the Rhode Island Department of Health (HEALTH) in partnership with the Department of Environmental Management (DEM) has enhanced their arbovirus surveillance system and control programs, through a cooperative agreement with the Centers for Disease Control and Prevention.

RHODE ISLAND METHODS

Avian surveillance

Dead bird sightings were reported by the public and selected groups by phone from mid-May through mid-October to DEM, Office of Mosquito Abatement Coordination (MAC), along with date of sighting, location, and description and number of birds. DEM mapped locations of the birds reported in order to assess potential hotspots for additional mosquito trapping and testing. Only a sample of dead birds that met specific criteria (sick with neurological symptoms such as staggering or tilted head, or those that have been dead less than 24 hours and have no obvious signs of injury) were picked up and tested for West Nile virus and Eastern Equine Encephalitis virus. Birds meeting testing criteria were transported daily to the HEALTH Laboratory for necropsies. PCR assays were conducted at the HEALTH Laboratory. Dead bird surveillance ceased on October 8, 2003.

Mosquito surveillance

From June 2 to October 28, 2003 approximately 30 trap sites were set weekly with CO₂-baited CDC light traps and/or gravid traps. Overnight mosquito collections were done and females were sorted by species into groups of 50 or less. Trapping was expanded where "clusters" of WNV and EEE positive birds were found, positive mosquito pools, or if human cases were detected. Up to 120 pools were assayed (via RT-PCR and cell culture, with IFA confirmation) weekly for WNV, EEE, and other selected viruses at the HEALTH Laboratory. Mosquito surveillance was halted on October 29, 2003.

Veterinary surveillance

Veterinarians are required to report any suspected animal cases with neurological illnesses to DEM, Office of Agriculture. The State Veterinarian assists community veterinarians to arrange testing for WNV or EEE in horses that have severe neurological disease.

Equines that have clinical symptoms and are positive to IgM Capture ELISA on serum or cerebrospinal fluid are considered a confirmed positive case. Equine will not demonstrate an IgM response from vaccination. Only natural exposure can produce IgM Antibody.

Human surveillance

To identify human illness caused by West Nile Virus, Rhode Island physicians, hospitals, and laboratories are required to report patients with any of the following syndromes immediately to HEALTH Office of Communicable Diseases (OCD). The syndromes include viral encephalitis (any age), or aseptic or suspect viral meningitis over the age of 17 years, or Guillain-Barré

syndrome. To enhance reporting, guidance was provided via a fax blast to all physicians and Rhode Island hospital infection control practitioners in May 2003. In addition, guidance was provided to Rhode Island Infection Control practitioners at their monthly meeting by the Consultant Public Health Nurse (surveillance program manager), who is a member of the group and a superb liaison for institutional reporting.

When reports are received, the cerebrospinal fluid and/or serum specimens are case managed to the HEALTH Laboratory for arboviral testing. In an effort to classify cases of WNV, a system was set up for collecting convalescent specimens on all patients meeting the initial case criteria for aseptic meningitis. A large commercial laboratory was identified and agreed to provide follow-up serum collections. HEALTH was billed for this service and the commercial laboratory forwarded the serum to the State Laboratory for convalescent testing. Nurses from HEALTH, Office of Communicable Diseases contacted aseptic meningitis cases and coordinated serum collection of suspect cases who were no longer hospitalized.

The HEALTH Laboratory performs IgM and IgG capture ELISA tests for WNV on suspected human cases. All positive WNV specimens undergo plaque reduction neutralization testing at the HEALTH Laboratory and a sample is forwarded to CDC independently for confirmation.

Enhanced surveillance for WNV testing was halted on October 31, 2003, although testing continued to be available at the HEALTH Laboratory upon special request.

RESULTS

Avian Surveillance

From June 2 to October 28, 2003, 651 dead birds were reported to DEM MAC. Seventy five (75) birds were submitted for testing. See Table 1.

Table1: Avian Surveillance, by county, Rhode Island, 2003					
County	Number of dead birds reported	Number of birds tested	Number of positive birds		
			WNV	EEE	TOTAL
Bristol	52	6	4	0	4
Kent	184	13	9	0	9
Newport	87	13	7	3	10
Providence	174	19	11	0	11
Washington	154	24	16	1	17
TOTAL	651	75	47	4	51

Of the 75 avians tested, 39 were crows and 36 were "other" birds (a detailed table of avian surveillance by species, can be found in the Appendix). A total of 47 of the submitted birds tested positive for WNV. 31 crows tested positive and the 16 "other" birds positive for WNV included 14 bluejays, one goldfinch, and one great horned owl. Four of the submitted birds tested positive for EEE. These included one blue jay and 3 homing pigeons. The EEE and WNV positive birds were reported between August 14, 2003 and October 7, 2003 from 25 towns.

Mosquito Surveillance

A total of 2383 mosquito pools (22,017 mosquitoes) were submitted for arboviral testing in 2003. The distribution of mosquito species collected for testing can be found in Table 2.

Scientific Name	Number Pools Collected	Number of Mosquitoes	Number of positive WNV pools (Number in pools)	Number of positive EEE pools (Number in pools)
<i>Aedes canadensis</i>	4	21		
<i>Aedes cantator</i>	2	7		
<i>Aedes trivittatus</i>	9	33		
<i>Aedes vexans</i>	247	2436		
<i>Anopheles crucians</i>	8	25		
<i>Anopheles punctipennis</i>	160	730		
<i>Anopheles quadrimaculatus</i>	19	46		
<i>Anopheles walkeri</i>	1	1		
<i>Coquillettidia perturbans</i>	130	1540		
<i>Culiseta impatiens</i>	38	166	1 pool (4)	
<i>Culiseta inornata</i>	2	2		
<i>Culiseta melanura</i>	25	103		
<i>Culiseta morsitans</i>	140	688	1 pool (8)	6 pools (79)
<i>Culiseta</i> sp.	3	4		
<i>Culex pipiens</i>	459	5584	5 pools (114)	11 pools (394)
<i>Culex restuans</i>	33	108		
<i>Culex</i> sp.	8	31		
<i>Culex salinarius</i>	22	87		
<i>Ochlerotatus abserratus</i>	1	1		
<i>Ochlerotatus canadensis</i>	312	6641		
<i>Ochlerotatus cantator</i>	54	248		
<i>Ochlerotatus cinereus</i>	4	74		
<i>Ochlerotatus excrucians</i>	42	267		
<i>Ochlerotatus intrudens</i>	2	2		
<i>Ochlerotatus japonicus japonicus</i>	153	462		
<i>Ochlerotatus punctor</i>	15	63		
<i>Ochlerotatus sollicitans</i>	61	581		
<i>Ochlerotatus sticticus</i>	1	8		
<i>Ochlerotatus stimulans</i>	1	1		
<i>Ochlerotatus taeniorhynchus</i>	62	998		
<i>Ochlerotatus triseriatus</i>	116	567		
<i>Ochlerotatus trivittatus</i>	91	216		
<i>Orthopodomyia signifera</i>	1	1		
<i>Psorophora ferox</i>	38	75		
<i>Uranotaenia sapphirina</i>	52	276		

Seven mosquito pools tested positive for WNV and seventeen mosquito pools tested positive for EEE during the 2003 season. The first WNV positive mosquito pool (*Culex pipiens*) was collected on August 21, 2003 (Figure 1). Two other positive pools were trapped on September 11, 2003, one pool on September 17, and one pool on September 22. Two pools of *Culiseta morsitans* mosquitoes were trapped on September 22, and one pool of *Culiseta impatiens* was trapped on October 11th. Three of the *Culex pipiens* pools that tested positive for WNV were

collected in Washington County, one pool was collected in Newport County and one pool was collected in Providence County. The WNV positive *Culiseta morsitans* pool was collected in Washington County, and the WNV positive *Culiseta impatiens* pool was collected in Newport County. See Table 3 for the distribution of all collected mosquito pools by county.

The first EEE positive mosquito pool (*Culex pipiens*) was collected on September 10, 2003 (Figure 1). 2 other positive pools were collected on September 11, two pools were collected on September 15, three pools were collected on September 17, one pool was collected on September 22, and two pools were collected on October 14. Two EEE positive *Culiseta morsitans* pool were collected on September 24, one pool was collected on September 29, one pool was collected on October 8, one pool was collected on October 14, and one pool was collected on October 20. All of the *Culex pipiens* pools that tested positive for EEE were collected from Washington County. Five of the EEE positive *Culex morsitans* pools were collected in Washington County, and one was collected in Newport County. See Table 3 for the distribution of all collected mosquito pools by county. Approximately 52.1% of all pools were collected in Washington County, 20.5% in Providence County, 13.1% in Newport County, and 10.3% and 4% in Kent County and Bristol County, respectively.

Table 3: Mosquito surveillance by county, 2003, Rhode Island

County	# WNV Positive pools (Mosquito species)	# EEE Positive pools (Mosquito species)	# pools collected (# mosquitoes in pool)
Bristol	0	0	98 (951)
Kent	0	0	245 (1256)
Newport	2 (1 <i>Culex pipiens</i> , 1 <i>Culex morsitans</i>)	1 (<i>Culiseta morsitans</i>)	311 (2126)
Providence	1 (<i>Culex pipiens</i>)	0	488 (3422)
Washington	4 (3 <i>Culex pipiens</i> , 1 <i>Culiseta morsitans</i>)	16 (11 <i>Culex pipiens</i> , 5 <i>Culiseta morsitans</i>)	1241 (14262)

Veterinary Surveillance

During the 2003 surveillance season, two horses tested positive for West Nile Virus, five horses tested positive for EEE, and one horse tested positive for both EEE and WNV. In addition to the horses, two emus tested positive for EEE.

The first EEE positive horse of the season became ill on September 3 in Westerly. The horse died, and was confirmed EEE positive at the HEALTH lab. The second and third horses, one from Westerly and one from South Kingstown, became ill on September 5. Both tested positive for EEE though IgM capture ELISA. One of the horses was euthanised, and the other horse recovered. Three other EEE positive horses were confirmed at the HEALTH lab in 2003. One of the horses was stabled in the Hope Valley area of Hopkinton and was reported to become ill on September 25. The other two horses were reported from Tiverton. The first horse became ill on September 29, and the other became ill on October 1. All three horses were euthanised.

The first WNV positive horse was stabled in the Carolina area of Charlestown, and became ill on September 15. The second horse was stabled in the Hope Valley area of Hopkinton, and became ill around September 25. Blood was drawn from both horses, and the National Veterinary Services Laboratory in Iowa, confirmed that the samples were positive for WNV. Both horses recovered.

A horse that was from a private stable in Lincoln became ill on October 1. Serological testing by the National Veterinary Services Laboratory in Ames, Iowa confirmed that the horse had both EEE and WNV. The horse recovered.

Two suspect emus were reported to RI DEM. The first emu was reported on September 12 in North Kingstown. The emu died and was confirmed positive for EEE by PCR at the Massachusetts State Lab. The second emu was housed at a pick your own apple orchard in Glocester. It became ill and died on September 22. RI DEM received positive confirmation of EEE on October 9 from the National Veterinary Services Laboratory in Ames, Iowa.

Human Surveillance

In 2003, a total of 133 serum and 102 cerebrospinal fluid specimens from 120 persons were tested by the HEALTH Laboratory. From June 4 to October 29, 2003, four cases of viral encephalitis and 75 cases of aseptic meningitis met the testing criteria for WNV testing. Out of the 75 cases of aseptic meningitis, 23 cases (30.7%) either refused or were not able to be contacted for convalescent testing. Seven cases of West Nile Virus infection were confirmed for the 2003 surveillance season.

A 58-year-old female resident of Newport County was the first confirmed West Nile virus case in 2003. She was admitted to the hospital the first week of September with a diagnosis of viral meningitis. She tested positive for West Nile virus in both cerebrospinal fluid (CSF) and serum samples by an IgM-capture enzyme-linked immunosorbent assay (ELISA). She was discharged from the hospital, and recovered.

The second case of the season was a 44-year old male from Providence County, who was a confirmed West Nile Fever case. He became ill the first week of September, and his symptoms included myalgia, headache, and a rash. He went to the ER for his illness, but was not admitted. Serological testing was performed and was confirmed positive by the HEALTH lab for WNV by IgM capture ELISA and plaque reduction neutralization test (PRNT).

A 48-year-old female from Providence County was the third confirmed WNV case of the season. She was admitted to the hospital on the 2nd week of September with a diagnosis of viral meningitis. Her symptoms began 3 days previous, and included myalgia, headache, altered mental status, and photophobia. A CSF specimen was confirmed positive for West Nile Virus at the HEALTH lab. She reports traveling to Massachusetts a month before her illness onset. She recalls being bitten often by mosquitoes and spending time at parks and beaches 2 weeks before illness onset. She recovered and was discharged from the hospital.

The fourth case was a 65-year-old female from Kent County who was a confirmed West Nile fever case. She presented to the ER with myalgia, headache, weakness and a fever, which began in the 2nd week of September, and was not admitted to the hospital. She tested positive for WNV in serum samples by an IgM-capture ELISA, with a PRNT confirmation at the HEALTH lab. She reports no travel outside Rhode Island in the 2 weeks before illness onset, but recalls being bitten by mosquitoes.

A 77-year-old female from Providence County was the fifth WNV infection in Rhode Island in 2003. She became ill the first week of October with nausea, vomiting, headache and stiff neck, and was admitted to the hospital the first week of October with a viral meningitis diagnosis. A CSF sample tested positive for WNV at the HEALTH lab. She recovered and was discharged. In the two weeks before illness onset, she traveled to Massachusetts for shopping and spent time sitting outside in a neighbor's yard at dusk.

The sixth case resulted in the first death of a Rhode Island resident due to West Nile Virus. The 72-year-old male from Providence County became ill the first week of October with nausea, vomiting, headache and stiff neck. He was admitted to the hospital ICU unit. CSF samples tested positive by IgM capture ELISA at the HEALTH lab. He traveled to Massachusetts and spent time

outdoors at dusk in the 2 weeks prior to illness. His remained in the hospital for 4 weeks, and was then transferred to a rehabilitation center, where he expired the third week of November.

The last case of WNV infection occurred in a 42-year-old female from Providence County. She was admitted to the hospital the 3rd week of October with nausea, vomiting, headache and fever that had begun approximately 5 days earlier. She was transferred to a medical facility in Maryland 4 days later. The RI Department of Health was notified by the Maryland Department of Health that a CSF specimen collected October 30 tested positive for WNV IgM by PCR

Comparison of National and Rhode Island WNV Surveillance

1999	28 counties in 4 states reported any WNV activity
2000	136 counties in 12 states & DC reported any WNV activity
2001	358 counties in 27 states & DC reported any WNV activity
2002	2,480 counties in 44 states & DC reported any WNV activity
2003 YTD (1/28/2004)	1,890 counties in 46 states & DC reported any WNV activity

Reported Human WNV Disease Cases, United States, 1999-2003*					
Year	Cases	Deaths	States	Counties	Onset Dates
1999	62	7	1	6	August 2-September 24
2000	21	2	3	10	July 20-September 27
2001	66	9	10	40	July 13-December 7
2002	4156	284	39 & DC	708	May 19-December 14
2003 YTD*	9122	223	45 & DC	1051	March 28 – December 14
* 2003 YTD: Provisional data as of 1/28/2004					

Reported Human WNV Disease Cases, Rhode Island, 1999-2003		
Year	Number of persons tested	Number of persons positive for WNV
1999	0	0
2000	42	0
2001	43	0
2002	82	2
2003	120	7

WNV Surveillance, US, 1999-2003 YTD*, Summary of Mosquito Data					
Year	# of positive pools	# of species	Earliest + pool	States	Counties
1999	18	6	9/12/99	3	8
2000	515	17	7/7/00	5	38
2001	919	27	5/31/01	16 & D.C.	70
2002	6033	29	5/22/02	33 & D.C.	---
2003 YTD*	7856	44	3/17/03	38 & D.C.	---
* 2003 YTD: Provisional data as of 1/28/2004					

WNV Surveillance, Rhode Island, 1999-2003, Summary of Mosquito Data					
Year	# of collected pools	# positive pools	Number of species	Earliest + pool	Counties
1999	0	0	0	0	0
2000	1113	0	0	0	0
2001	1856	14	8	7/16/01	3
2002	1417	4	3	8/28/02	2
2003	2383	7	2	8/21/03	3

WNV Surveillance, US, 1999-2003 YTD*, Summary of Dead Bird Data			
Year	# of positive birds	States	Counties
1999	249	4	28
2000	4305	12 & D.C.	136
2001	7332	26 & D.C.	328
2002	15,745	42 & D.C.	1888
2003 YTD*	11,613	43 & D.C.	1639
* 2003 YTD: Provisional data as of 1/28/2004			

WNV Surveillance, Rhode Island, 1999-2003, Summary of Dead Bird Data				
Year	Number of birds reported	Number of birds positive	Earliest + reported	Counties
1999	0	0	0	0
2000	1466	88	8/14/00	4
2001	1324	245	5/30/01	5
2002	1441	167	6/17/02	5
2003	651	47	8/14/03	5

WNV Surveillance, US, 1999-2002 YTD*, Summary of Equine Data			
Year	# of equine cases	States	Counties
1999	25	1	2
2000	63	6	26
2001	731	19	125
2002	12038	39	1678
2003 YTD*	4433	42	1130
* 2003 YTD: Provisional data as of 1/28/2004			

WNV Surveillance, Rhode Island, 1999-2002, Summary of Equine Data			
Year	# of equine cases	County	Month of onset
1999	0	---	---
2000	1	Washington	August
2001	0	---	
2002	1	Kent County	October
2003	9	See Table Below	See Table Below

WNV Surveillance, Rhode Island, Summary of Equine Data 2003			
County	Number of Horses	Month of Onset	Arbovirus +
Newport	2	September, October	EEE
Providence	1	October	EEE and WNV
Washington	6	September	4 EEE, 2 WNV

APPENDIX

Table 4: Distribution of avians tested, Rhode Island, 2000-2003				
Species	2000	2001	2002	2003
American Kestrel	1			
Bald Eagle		1		
Barred owl			1	
Blue jay	48	56	24	21
Broadwinged Hawk	1			
Brow Creeper	1			
Brow Thrasher	2			
Cardinal	2		1	
Catbird	5	2	1	
Cedar waxwing		1		
Chicken, R.I. Red			2	
Cockatiel		1	1	1
Cooper's Hawk				3
Cowbird	1			
Crow	138	262	198	39
Crowbird	1			
Domestic Turkey				1
Duck	1			
Finch	1	2		
Flicker	1			
Gold finch	1	2		1
Grackle	15	19	3	1
Great Cormorant	2	1		1
Great Horned Owl				2
Gull	5			
Hawk	5	3	4	
Homing Pigeon				3
House finch		2		
Kingfisher				1
Laughing gull		4		
Mockingbird	4			
Mourning dove	11	6	4	
Mute swan			1	
Northern Raven	1			
Orchid Oriole	1			
Osprey		1	1	
Parakeet		2	1	
Parrot			2	
Peacock	1			
Pigeon	1			
Red tailed hawk	3	1	1	
Robin	12	2	1	
Rock dove		7		
Sandpiper			2	
Screech Owl		1		
Sea gull	1		1	
Sharp-shinned hawk	2	1		
Sparrow Sp.	29	7		
Starling	11	3		
Swaenson's Hawk	1			
Thrush	1	2		
Turkey Vulture				1
Warbler	1			
Woodpecker	3			

Table 5: Distribution of mosquito species tested, Rhode Island, 2002-2003					
Scientific Name	Number Trapped and Tested, 2002	Number WNV positive, 2002	Number Trapped and Tested, 2003	Number WNV positive, 2003	Number EEE positive, 2003
<i>Aedes canadensis</i>			21		
<i>Aedes cantator</i>			7		
<i>Aedes cinereus</i>	14				
<i>Aedes sp. / Ochlerotatus sp.</i>	37				
<i>Aedes trivittatus</i>			33		
<i>Aedes vexans</i>	953	2 pools: (3) & (3) mosquitoes	2436		
<i>Anopheles crucians</i>	0		25		
<i>Anopheles punctipennis</i>	182		730		
<i>Anopheles quadrimaculatus s.l.</i>	66		46		
<i>Anopheles sp.</i>	1				
<i>Anopheles walkeri</i>	14		1		
<i>Coquillettidia perturbans</i>	3291		1540		
<i>Culex pipiens</i>	456	2 pools- (2) & (1) mosquitoes	5584	5 pools – (3), (7), (9), (45), (50) mosquitoes	11 pools – (39), (50), (50), (46), (36), (32), (46), (50), (20), (9), (16) mosquitoes
<i>Culex restuans</i>	180		108		
<i>Culex salinarius</i>			87		
<i>Culex sp.</i>	859		31		
<i>Culiseta impatiens</i>	113		166	1 pool – (4) mosquitoes	
<i>Culiseta inornata</i>			2		
<i>Culiseta melanura</i>	0		103		
<i>Culiseta morsitans</i>	158		688	1 pool – (8) mosquitoes	6 pools – (8), (50), (3), (4), (9), (5) mosquitoes
<i>Culiseta sp.</i>	613		4		
<i>Ochlerotatus aberratus</i>	0		1		
<i>Ochlerotatus aurifer</i>	56				
<i>Ochlerotatus canadensis</i>	429		6641		
<i>Ochlerotatus cantator</i>	407		248		
<i>Ochlerotatus cinereus</i>			74		
<i>Ochlerotatus excrucians</i>	92		267		
<i>Ochlerotatus intrudens</i>	53		2		
<i>Ochlerotatus japonicus</i>	39		462		
<i>Ochlerotatus punctor</i>	24		63		
<i>Ochlerotatus sollicitans</i>	1565		581		
<i>Ochlerotatus sticticus</i>	7		8		
<i>Ochlerotatus stimulans</i>	5		1		
<i>Ochlerotatus taeniorhynchus</i>	1943		998		
<i>Ochlerotatus triseriatus</i>	178		567		
<i>Ochlerotatus trivittatus</i>	32		216		
<i>Orthopodomyia signifera</i>	0		1		
<i>Psorophora ferox</i>	2		75		
<i>Uranotaenia sapphirina</i>	106		276		

Figure 1. Arbovirus Surveillance, Rhode Island, 2003

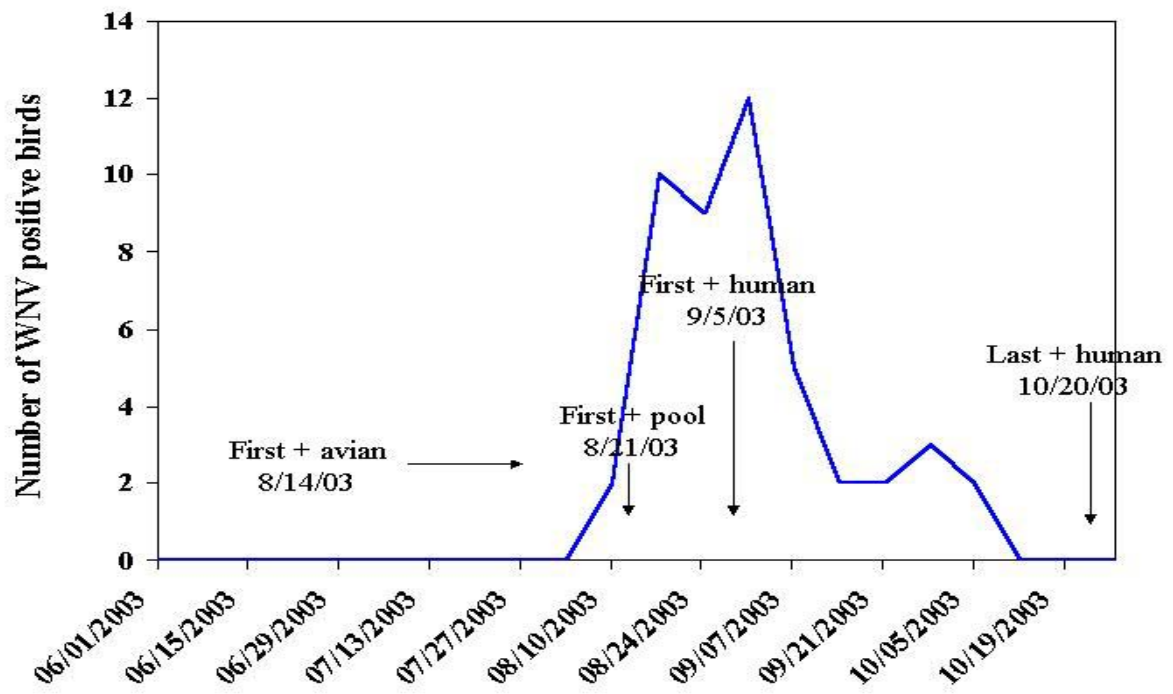


Figure 2. Geographical Distribution of Human Cases (by County) and Positive Mosquito Pools (by Town), Rhode Island, 2003

